

Claims

WHAT IS CLAIMED IS:

- 1 1. A method for shaping a sender's transmission rate, comprising:
2 receiving a network packet from a sender over a network;
3 identifying a desired transmission rate for the sender; and
4 delaying the sending of an acknowledgment to the sender for an elapsed
5 period in order to achieve the desired transmission rate, wherein the sender
6 transmits a subsequent network packet upon receipt of the acknowledgment.
- 1 2. The method of claim 1 wherein the receiving further includes receiving the
2 network packet in a first queue associated with an Internet Protocol (IP) application.
- 1 3. The method of claim 2 further comprising forwarding the network packet to
2 a Transmission Control Protocol (TCP) application after the elapsed period of time
3 has passed, and wherein the acknowledgment is sent from the TCP application to
4 the sender upon receipt of the network packet.
- 1 4. The method of claim 1 further comprising modifying a header of the
2 acknowledgment that is sent to the sender which instructs the sender to slow
3 transmission rates down for the subsequent network packet sent to the method.
- 1 5. The method of claim 4 wherein the modifying further includes identifying a
2 single byte as missing from the network packet which instructs the sender to resend
3 the missing byte and to slow transmission rates down for the subsequent network
4 packet sent to the method.
- 1 6. The method of claim 5 wherein the sending further includes using a
2 Selective Acknowledgment technique when sending the acknowledgement to the
3 sender.

1 7. The method of claim 4 wherein the sending further includes using an
2 Explicit Congestion Notification technique when sending the acknowledgment.

1 8. A method for rate shaping network transmissions, comprising:
2 detecting network transmissions occurring with a first application and a
3 second application;
4 determining that the first application is a higher priority than the second
5 application; and
6 decreasing a rate at which acknowledgments are sent to the second
7 application in order to decrease a second application's transmission rate of
8 network packets.

1 9. The method of claim 8 wherein the decreasing further includes delaying the
2 forwarding of a number of the network packets associated with the second
3 application from an Internet Protocol (IP) stack layer to a Transmission Control
4 Protocol (TCP) stack layer in order to decrease the rate.

1 10. The method of claim 8 further comprising assigning priorities to the first and
2 second applications automatically based on communication ports being used by the
3 first and second applications.

1 11. The method of claim 8 further comprising manually assigning priorities to
2 the first and second applications.

1 12. The method of claim 8 further comprising instructing the second application
2 via headers associated with the acknowledgments to decrease the second
3 application's transmission rate.

1 13. The method of claim 8 further comprising communicating with the first and
2 second applications via Transmission Control Protocol/Internet Protocol (TCP/IP).

1 14. The method of claim 8 further comprising intentionally not sending a needed
2 one of the acknowledgments for the second application, which causes the second
3 application to resend a number of the network packets and to decrease the second
4 application's transmission rate.

1 15. A transmission rate-shaping system, comprising:
2 a network packet queue for housing network packets received from a sender;
3 and
4 a rate-shaping application that selectively delays sending acknowledgments
5 to the sender for each of the network packets received in the network packet queue,
6 wherein a sender's receipt of each of the acknowledgments cause the sender to
7 transmit another one of the packets to the network packet queue.

1 16. The rate-shaping system of claim 15 wherein the rate-shaping application
2 alters a Transmission Control Protocol (TCP) Clock rate for sending the
3 acknowledgments.

1 17. The rate-shaping system of claim 16 wherein the rate-shaping application
2 alters the TCP clock rate by controlling packet release rates from the network packet
3 queue located at an Internet Protocol layer of a network stack to a TCP layer of the
4 network stack.

1 18. The rate-shaping system of claim 15 wherein the rate-shaping application
2 neglects to transmit a needed one of the acknowledgments to the sender when the
3 sender is transmitting the network packets at a higher rate than is desired.

1 19. The rate-shaping system of claim 15 wherein the rate-shaping application
2 sends customized header information with the acknowledgments that the sender
3 uses to adjust a sender's transmission rate to a slower rate.

1 20. The rate-shaping system of claim 15 wherein the network packet queue and
2 the rate shaping application reside at an Internet Protocol layer of a network stack.

1 21. A rate-shaping data structure residing in computer-readable medium, the
2 rate-shaping data structure comprising:
3 an identifier for a sender;
4 a communication port identifier for receiving network packets from the
5 sender; and
6 a storage location for housing or referring to each of the received network
7 packets in the rate-shaping data structure;
8 wherein when the rate-shaping data structure releases one or the received
9 network packets from its storage location, an acknowledgment application sends an
10 acknowledgment to the sender and upon receipt of the acknowledgment the sender
11 sends another one of the network packets which is stored in an appropriate storage
12 location of the rate-shaping data structure.

1 22. The rate-shaping data structure of claim 21 wherein the rate-shaping data
2 structure resides at an Internet Protocol layer of a network stack.

1 23. The rate-shaping data structure of claim 21 wherein the acknowledgment
2 application is a Transmission Control Protocol (TCP) application that resides at a
3 TCP layer of the network stack.

1 24. The rate-shaping data structure of claim 21 wherein a number of the received
2 network packets or portions of the received network packets are not released to the
3 acknowledgment application, which causes the sender to resend the non-released
4 network packets or portions and causes the sender to slow its transmission rate of
5 the network packets.

1 25. The rate-shaping data structure of claim 21 wherein the acknowledgment

2 application uses an Explicit Congestion Notification (ECN) technique to notify the
3 sender to slow its transmission rate of the network packets.

1 26. The rate-shaping data structure of claim 21 wherein the rate-shaping data
2 structure is used with Transmission Control Protocol/Internet Protocol (TCP/IP)
3 communications to slow transmission rates of the sender.

1 27. The rate-shaping data structure of claim 21 wherein the identifier and the
2 communication port identifier determine a desired transmission rate for the sender
3 and the desired transmission rate determines a release rate of each of the received
4 network packets from the rate-shaping data structure.